IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	James Z. Liu	**EXAMINER:**	Turk, Neil N.
SERIAL NO.:	10/815,336	**GROUP:**	7533
FILED:	04/01/2004	**ATTY DKT NO.:**	H0006268-0769
TITLE:	**MULTIPLE MODES ACOUSTIC WAVE SENSOR**		

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REQUEST FOR CONTINUED EXAMINATION AND AMENDMENTS AND REPLY TO OFFICE ACTION

Dear Sir:

In response to the Office Action dated November 21, 2007 in the above captioned matter, please enter the following amendments and remarks:

Amendments to claims begin on Page 2 of this Paper.

Remarks begin on Page 8 of this Paper.

CLAIM AMENDMENTS

Please amend claims 1, 2, 13, 14, 15, 16, 18, 22 and cancel claims 24-26 as follows:

1. (Currently Amended) A multiple modes sensing system, comprising:

an acoustic wave sensor comprising a plurality of sensing components for monitoring a chemical species, wherein said plurality of sensing components is disposed within a cavity formed from a plurality of walls of said acoustic wave sensor, wherein each sensing component of said plurality of sensing components is coated with a differing sensing film, and wherein each sensing component of said plurality of sensing components comprises a quartz crystal;

a plurality of oscillators associated with said plurality of sensing components, wherein each sensing component ~~components~~ of said plurality of sensing components is located in a feedback loop with an oscillator of said plurality of oscillators to thereby provide a multiple mode acoustic wave sensor that provides multiple mode frequency outputs thereof; and

a frequency counter that communicates with said plurality of oscillators, wherein said frequency counter is under the command of a processor, wherein a calculated difference among said multiple mode frequency outputs is utilized to promote an increase in sensing accuracy by eliminating responses due to environmental changes other than said monitored chemical species.

2. (Currently Amended) The system of claim 1 wherein said differing sensing film comprises sensing film materials such that said differing sensing film ~~each sensing component of said plurality of sensing components comprises a quartz crystal~~ comprises desired response properties by mixing analyte molecules and said sensing film materials mixed in a solution in order to result a suitable formation of

said sensing film based on an interaction force selected by an affinity between said sensing film and said analyte, thereby achieving said sensing film with said desired response properties.

3. (Original) The system of claim 1 wherein said multiple modes frequency outputs comprise at least one of the following types of data: flexural plate mode (FMP) data, acoustic plate mode data, and shear-horizontal acoustic plate mode (SH-APM) data.

4. (Original) The system of claim 3 wherein said multiple mode frequency outputs further comprises at least one of the following types of data: amplitude plate mode (APM) data, thickness shear mode (TSM) data, surface acoustic wave mode (SAW), and bulk acoustic wave mode (BAW) data.

5. (Original) The system of claim 4 wherein said multiple mode frequency outputs further comprises at least one of the following types of data: torsional mode data, love wave data, leaky surface acoustic wave mode (LSAW) data, and pseudo surface acoustic wave mode (PSAW) data, and at least one multiple mode acoustical vibration amplitude.

6. (Original) The system of claim 5 wherein said multiple mode frequency outputs further comprises at least one of the following types of data: transverse mode data, surface-skimming mode data, surface transverse mode data, harmonic mode data, and overtone mode data.

7. (Original) The system of claim 5 wherein said at least one multiple mode acoustical vibration amplitude is controlled by said plurality of oscillators.

8. (Previously Cancelled)

9. (Original) The system of claim 1 said acoustic wave sensor comprises a SAW sensor.

10. (Previously Cancelled)
11. (Previously Cancelled)
12. (Previously Cancelled)

13. (Currently Amended) The system of claim 1 wherein said sensing components of said plurality of sensing components comprise electrode materials chosen from among a group consisting of ~~comprising at least one of~~ the following metal-nonmetal compounds: TiN, $CoSi_2$ ~~CoSi2~~, and WC.

14. (Currently Amended) The system of claim 1 wherein said sensing components of said plurality of sensing components comprise electrode materials chosen from among a group consisting of ~~comprising at least one~~ of the following alloys: NiCr and CuAl.

15. (Currently Amended) A dual modes sensing system, comprising:

an acoustic wave sensor comprising two sensing components for monitoring a chemical species, wherein each sensing component among said plurality of sensing components comprises a quartz crystal, and wherein each sensing component among said plurality of sensing components are disposed within a respective channel within a cavity formed from a plurality of walls of said acoustic wave sensor, such that each of said sensing components is coated with a differing sensing film;

two identical oscillators associated with said sensing components, wherein each of said sensing components is located in a feedback loop with each of said two

identical oscillators to thereby provide a dual mode acoustic wave sensor that provides dual mode frequency outputs thereof; and

a frequency counter that communicates with said two identical oscillators, wherein said frequency counter is under the command of a processor, wherein a calculated difference among said dual mode frequency outputs is utilized to promote an increase in sensing accuracy by eliminating responses due to environmental changes other than said monitored chemical species.

16. (Currently Amended) The system of claim 15 wherein said differing sensing film comprises sensing film materials such that said differing sensing film ~~each sensing component of said plurality of sensing components comprises a quartz crystal~~ comprises desired response properties by mixing analyte molecules and said sensing film materials mixed in a solution in order to result a suitable formation of said sensing film based on an interaction force selected by an affinity between said sensing film and said analyte, thereby achieving said sensing film with said desired response properties.

17. (Previously Cancelled)

18. (Currently Amended) The system of claim 15 wherein said sensing components comprise piezoelectric materials chosen from among a group consisting of ~~comprising at least one~~ of the following materials: α-quartz, lithium niobate (LiNbO3), lithium tantalate ($LiTaO_3$), $Li_2B_4O_7$, $AlPO_4$, $GaPO_4$ ~~(LiTaO3), Li2B4O7, AlPO4, GaPO4~~, langasite ($La_3Ga_5SiO_{14}$ ~~La3Ga5SiO14~~), ZnO, and epitaxially grown nitrides including Al, Ga or In.

19. (Previously Amended) A multiple modes sensing system, comprising:

a surface acoustic wave (SAW) sensor comprising a plurality of quartz crystal sensing components for monitoring a chemical species, wherein said plurality of

quartz crystal sensing components is disposed within a cavity formed from a plurality of walls of said acoustic wave sensor, wherein each quartz crystal sensing component of said plurality of quartz crystal sensing components is coated with a differing sensing film;

a plurality of oscillators associated with said plurality of quartz crystal sensing components, wherein each quartz crystal sensing components of said plurality of quartz crystal sensing components is located in a feedback loop with an oscillator of said plurality of oscillators to thereby provide a multiple mode SAW sensor that provides multiple mode frequency outputs thereof; and

a frequency counter that communicates with said plurality of oscillators, wherein said frequency counter is under the command of a processor, wherein a calculated difference among said multiple mode frequency outputs is utilized to promote an increase in sensing accuracy by eliminating responses due to environmental changes other than said monitored chemical species.

20. (Previously Cancelled)

21. (Previously Submitted) The system of claim 19 wherein said sensing components of said plurality of sensing components comprise electrode materials chosen from among a group comprising at least one of the following metals: Pt, Au, Rh, Ir, Cu, Ti, W, Cr, and Ni.

22. (Currently Amended) The system of claim 19 wherein said sensing components of said plurality of sensing components comprise electrode materials chosen from among a group consisting ~~comprising at least one~~ of the following alloys: NiCr and CuAl.

23. (Previously Submitted) The system of claim 19 wherein said cavity comprises a first channel and a second channel, wherein said first channel is composed of a

sensing coating and said second channel is composed of a different sensing coating, wherein said first and second channels are located in a feedback path of two identical oscillators and an output thereof provides the difference of two frequencies produced.

24. (Cancelled)
25. (Cancelled)
26. (Cancelled)

REMARKS

I. Claim Objections

In the office action dated November 21, 2008 claims 13, 18, 24, and 25 were objected to because of the following informalities: the Examiner argued that in the chemical compound formulas recited, proper sub-scripting of numerals in necessary. The Examiner argued that appropriate correction is required. The Applicant notes that claims 13 and 18 have been amended to overcome these formalities. Claims 25 and 25 have been cancelled by amendment, thereby rendering the aforementioned objections to claims 24-25 moot. Applicant therefore respectfully requests withdrawal of the objections to claims 18 and 18.

II. Claim Rejections – 35 USC § 102 / 35 USC § 102

Requirements for *Prima Facie* Anticipation

A general definition of *prima facie* unpatentability is provided at 37 C.F.R. §1.56(b)(2)(ii):

> A *prima facie* case of unpatentability is established when the information *compels a conclusion* that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability. (*emphasis added*)

"Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration." *W.L. Gore & Associates v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303, 313 (Fed. Cir. 1983) (citing *Soundscriber Corp. v. United States*, 360 F.2d 954, 960, 148 USPQ 298, 301 (Ct. Cl.), *adopted*, 149 USPQ 640 (Ct. Cl. 1966)), *cert. denied*, 469 U.S. 851 (1984). Thus, to anticipate the applicants' claims, the reference cited by the Examiner must disclose each element

recited therein. "There must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention." *Scripps Clinic & Research Foundation v. Genentech, Inc.*, 927 F.2d 1565, 18 USPQ 2d 1001, 1010 (Fed. Cir. 1991).

To overcome the anticipation rejection, the applicants need only demonstrate that not all elements of a *prima facie* case of anticipation have been met, *i.e.*, show that the reference cited by the Examiner fails to disclose every element in each of the applicants' claims. "If the examination at the initial state does not produce a prima face case of unpatentability, then without more the applicant is entitled to grant of the patent." *In re Oetiker*, 977 F.2d 1443, 24 USPQ 2d 1443, 1444 (Fed. Cir. 1992).

Requirements for *Prima Facie* Obviousness

The obligation of the examiner to go forward and produce reasoning and evidence in support of obviousness is clearly defined at M.P.E.P. §2142:

> "The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness."

The U.S. Supreme Court ruling of April 30, 2007 (*KSR Int'l v. Teleflex Inc.*) states:

"The TSM test captures a helpful insight: A patent composed of several elements is not proved obvious merely by demonstrating that each element was, independently, known in the prior art. Although common sense directs caution as to a patent application claiming as innovation the combination of two known devices according to their established functions, it can be important to identify a reason that would have prompted a person of ordinary skill in the art to combine the elements as the new invention does."

"To facilitate review, this analysis should be made explicit."

The U.S. Supreme Court ruling states that it is important to identify a *reason* that would have prompted a person to combine the elements and to make that analysis *explicit*. MPEP §2143 sets out the further basic criteria to establish a *prima facie* case of obviousness:

1. a reasonable expectation of success; and

2. the teaching or suggestion of all the claim limitations by the prior art reference (or references when combined).

It follows that in the absence of such a *prima facie* showing of obviousness by the Examiner (assuming there are no objections or other grounds for rejection) and of a *prima facie* showing by the Examiner of a *reason* to combine the references, an applicant is entitled to grant of a patent. Thus, in order to support an obviousness rejection, the Examiner is obliged to produce evidence compelling a conclusion that the basic criterion has been met.

Martin or Martin in view of Frye

In the office action dated November 21, 2007, Claims 1, 3, 4, 9, and 15 were rejected under 35 U.S.C. 102(b) as being anticipated by Martin (U.S. Patent No. 5,235,235), or, in the alternative, under 35 U.S.C. 103(a) as obvious over Martin in view of Frye et al (U.S. Patent No. 5,076,094), hereinafter Frye ' 094.

The Examiner argued that Martin discloses multiple-frequency acoustic wave devices for chemical sensing in both gas and liquid phase. In support of this argument, the Examiner cited the Abstract of Martin. The Examiner asserted that Martin discloses that acoustic wave devices function as highly sensitive detectors of changes in surface mass, and argued that specific sensors are achieved by securing a film capable of immobilizing a particular species from the environment to the interaction region of the device (citing lines 20-39, col. 1 of Martin).

The Applicant respectfully disagrees with this assessment and notes that Col. 1, lines 20-39 merely indicates that acoustic wave devices have been demonstrated in a number of sensing applications, including gas and vapor and liquid. This does

not constitute a disclose or teaching by Martin of a multiple mode sensing device wherein a calculated difference among said multiple mode frequency outputs is utilized to promote an increase in sensing accuracy by eliminating responses due to environmental changes other than the monitored chemical species.

The Examiner argued that Martin discloses a sensor 1 that includes two or more pairs of interdigital electrodes or transducers (IDTs) 10 having different periodicities. The Examiner asserted that Martin discloses that each IDT is comprised of first and second electrodes 10a, 10b, and the IDT's are patterned on a piezoelectric substrate 12. The Examiner also argued that Martin discloses that each pair of IDTs may launch and receive various Aws, including surface acoustic wave (SAW), also known as a Rayleigh wave, as well as several acoustic place modes (APMs). The Examiner further argued that Martin discloses that SAW is typically chosen for gas-phase and materials-characterization applications, while horizontal APM (SH-APM) is chosen for liquid-phase applications. The Examiner additionally argued that Martin shows in FIGS. 3 and 4 electronic test and measurement circuitry used to launch, receive, and monitor the propagation characteristics (citing lines 30-67, col. 4, FIGS. 1-4 of Martin). The Examiner also asserted that Martin discloses an electronic apparatus 40 for measuring changes in AW velocity and attenuation at multiple frequencies. The Examiner also asserted that Martin discloses pairs of output IDTs 10 that are connected into a feedback loop of an associated amplifier network 42, and that each functions as a separate free-running oscillator circuit.

The Applicant respectfully disagrees with this assessment. Applicant's claims 1 and 15 generally include the claim limitations of an acoustic wave sensor comprising a plurality of sensing components for monitoring a chemical species, wherein said plurality of sensing components is disposed within a cavity formed from a plurality of walls of said acoustic wave sensor, wherein each sensing component of said plurality of sensing components is coated with a differing sensing film, and wherein each sensing component of said plurality of sensing

components comprises a quartz crystal. Applicant's claims 1 and 15 also include the claim limitations of a plurality of oscillators associated with said plurality of sensing components, wherein each sensing component of said plurality of sensing components is located in a feedback loop with an oscillator of said plurality of oscillators to thereby provide a multiple mode acoustic wave sensor that provides multiple mode frequency outputs thereof; and a frequency counter that communicates with said plurality of oscillators, wherein said frequency counter is under the command of a processor, wherein a calculated difference among said multiple mode frequency outputs is utilized to promote an increase in sensing accuracy by eliminating responses due to environmental changes other than said monitored chemical species.

Applicant notes that all such claim limitations are not taught, suggested, or disclosed by Martin. For example, Martin provides no teaching of the use of quartz crystals and also different sensing films covering such quartz crystals. Thus, it is clear that Martin does not disclose, teach, or suggest all of the claim limitations of Applicants claims 1 and 15 and hence, any claims that depend from claims 1 and 15.

The Examiner further argued that Martin discloses that an associated frequency counter 46 is under the control of a computer 30, and detects the frequency of oscillation of each oscillator circuit (citing Martin, lines 6-67, Col. 6, and FIGS 3 and 4). The Applicant respectfully disagrees with this assessment. There is no indication in Martin that computer 30 detects the frequency of oscillation of each oscillator circuit. Col. 6, lines 20-25 of Martin discusses the use of a 10 dB coupler 30 and a computer 24 that controls the operation of the source 28 and the vector voltmeter 32 of Martin. Similarly, FIGS. 3-4 illustrate computer 30 as receiving data from the diff. power meter 44, the frequency counter 46, and so forth but this is not evidence that the frequency counter 46 is under the command of computer 30. Also, there is no teaching here that the frequency counter 46 communicates with oscillators of Martin. There is also no indication of a

processor, wherein the frequency counter is under the command of the processor, and wherein a calculated difference among said multiple mode frequency outputs is utilized to promote an increase in sensing accuracy by eliminating responses due to environmental changes other than said monitored chemical species. The Examiner has pointed to computer 30 but has not identified a specific processor in Martin.

The Examiner asserted that any of the frequency counters 46 communicate with a plurality of oscillators such that all the oscillators and frequency counters are connected within the same circuitry. Again, the Examiner has not identified a processor in Martin that specifically controls the frequency counter, and wherein a calculated difference among said multiple mode frequency outputs is utilized to promote an increase in sensing accuracy by eliminating responses due to environmental changes other than said monitored chemical species.

The Examiner further argued that Martin discloses an example of a fabricated device in which the interdigital transducers were defined using an etching process from Au-on-Cr metallization (citing lines 15-57, Col. 5 of Martin). Applicant notes that the use of Au on Cr by Martin is irrelevant in that Martin does not provide for a teaching of the use of quartz crystals.

Additionally, the Examiner argued that if the disclosure to specific sensors achieved by securing a film capable of immobilizing a particular species from the environment to the interaction region of the device and the various interaction regions 13 disclosed by Martin are not taught taken to read as sensing regions with differing sensing films, that it would have been obvious to modify Martin.

The Applicant respectfully disagrees with this assessment. Martin does not disclose, teach or suggest the use of differing sensing films. In fact it is not clear that Martin even teaches the use of sensing films. The single interactive region 13 disclosed by Martin, for example does not constitute sensing films such as those taught by Applicant's invention. Instead, Martin shows a single region 13 not different regions, and certainly not different sensing films. There is no evidence in Martin to indicate that the single interactive region of Martin constitutes a plurality

of sensing regions with differing sensing films. The Examiner asserts that it would have been obvious to modify Martin to provide differing sensing films, but has not made explicit how this would be achieved, particularly because adding sensing films to Martin would damage the sensitivity of the IDT's 10 of Martin, which operate according to specific frequency ranges. For example, Col. 4, lines 46-49 describes various frequency ranges with respect to the components of Martin's device. Abruptly adding a number of different sensing films would interfere with such frequencies and ultimately the effectiveness of Martin's device. Thus, it would not be "obvious" to modify Martin as argued by the Examiner to achieve differing sensing films, particularly when Martin does not even utilize different quartz crystals. The Examiner did not make explicit how Martin would be modified in this manner, but only asserted that Martin could be modified without pointing out which specific components would actually be modified and connected to one another to achieve Applicant's claim limitations.

The Examiner further asserted that Frye '094 discloses a dual-output acoustic wave sensor for molecular identification. The Examiner also asserted that Frye '094 discloses that acoustic wave chemical sensors utilize a thin film coating which sorts or binds the chemical species to be detected and when the sorption/binding is selective for the chemical species of interest, a selective chemical sensor is obtained. Additionally, the Examiner asserted that Frye '094 discloses that because this selectivity is far from perfect, an array of sensors with different coatings is used (the Examiner cited lines 33-41, Col. 6 of Frye '094 in support of this argument). The Examiner therefore argued that it would have been obvious to modify Martin to include differing sensing films as taught by Frye '094 so as to provide a more selective AW sensor.

The Applicant respectfully disagrees with this assessment. One skilled in the art would not have looked to Frye '094 as a basis for adding "different coatings" to the Martin device. As explained previously, adding sensing films to the Martin device would damage the sensitivity of the IDT's 10 of Martin, which operate

according to specific frequency ranges. For example, Col. 4, lines 46-49 describes various frequency ranges with respect to the components of Martin's device. Abruptly adding a number of different sensing films would interfere with such frequencies and ultimately the effectiveness of Martin's device. Thus, it would not be "obvious" to modify Martin as argued by the Examiner by adding different sensing films such as taught by Frye '094 because such films would render the Martin device inoperable and achieve poor sensing results, particularly because neither Martin nor Frye '094 even utilize quartz crystals. It must be appreciated that simply because two references, (e.g., Martin and Frye '094) teach devices that provide acoustic waves or utilize acoustic waves does not mean that one can easily combine such highly sensitive devices or combine certain features from one device with the other device to achieve a working combination. Such devices, even if modified slightly, likely would not function in the manner suggested by the Examiner because such slight modifications to highly sensitive devices such as Martin and Frye '094 typically would damage the modified device.

The Applicant reminds the Examiner that a patent composed of several elements is not proved obvious merely by demonstrating that each element was, independently, known in the prior art. Although common sense directs caution as to a patent application claiming as innovation the combination of two known devices according to their established functions, it can be important to identify a reason that would have prompted a person of ordinary skill in the art to combine the elements as the new invention does. Neither Martin nor Frye '094 teach quartz crystals or could the Martin device be easily modified to include differing sensing films. The Examiner's analysis has not been explicit as to how each and every claim limitation of Applicant's claims 1 and 15 would be achieved by a combination of Frye '094 and Martin.

Based on the foregoing, it is clear that a reasonable expectation of success for a combination of Frye '094 and Martin to achieve all of the claim limitations of Applicant's invention would not result. Additionally, Martin and Frye '094, either

individually or in combination with one another, do not teach or suggest all of the claim limitations of Applicant's claims 1 and 15. It follows that in the absence of such a *prima facie* showing of obviousness by the Examiner (assuming there are no objections or other grounds for rejection) and of a *prima facie* showing by the Examiner of a *reason* to combine the references, the applicant is entitled to an allowance of claims 1 and 15. Thus, the Examiner has failed to satisfy the requirements of both the prima facie anticipation test and the prima facie obviousness test indicated above. As such, the Applicant submits that the rejection to claims 1, 3, 4, 9, and 15 under 35 U.S.C. 102(b) as being anticipated by Martin or, in the alternative, under 35 U.S.C. 103(a) as obvious over Martin in view of Frye '094, has been traversed. Applicant respectfully requests withdrawal of the aforementioned rejection to claims 1, 3, 4, 9, and 15 under 35 U.S.C. 102(b) and 35 U.S.C. 103(a).

Pfeifer in view of Frye '094

Claims 1-4, 9, 15, 16, 18, 19, 21, and 23 were rejected under 35 U.S.C. 103(a) as being unpatentable over Pfeifer et al (U.S. Patent No. 5,571,944), hereinafter Pfeifer '944, in view of Frye '094.

The Examiner argued that Pfeifer '944 discloses an acoustic wave based moisture sensor that includes a detector 110 and reference 120 SAW device that are used as feedback elements in oscillator circuits. The Examiner further argued that Pfeifer '944 also discloses sensing film 12 and reference film 14, as well as RF amplifiers 115 and 125 connected across respective transducer pairs 114 and 124, and a frequency counter 18 connected to detect the difference frequency between the two oscillator circuits (the Examiner cited columns 3-4 and FIGS. 1, 6, 7 of Pfeifer '944 in support of this argument). The Examiner asserted that Pfeifer '944 discloses that in addition to a SAW device, any acoustic wave device may be used in place of the SAW device, such as shear mode resonators (the Examiner argued "quartz crystal microbalances"), acoustic plate mode devices, and flexural plate

wave devices (the Examiner cited lines 30-42, Col. 7 of Pfeifer '944 in support of this argument).

The Examiner admitted that Pfeifer '944 does not disclose differing sensing films on the sensing regions and then indicated that Frye '094 has been discussed above.

The Examiner therefore asserted that it would have been obvious to modify Pfeifer '944 to include differing sensing films as taught by Frye '094 so as to provide a more selective AW sensor.

The Applicant respectfully disagrees with this assessment. The combination of Pfeifer and Frye '094 does not disclose all of the following claim limitations:

> an acoustic wave sensor comprising a plurality of sensing components for monitoring a chemical species, wherein said plurality of sensing components is disposed within a cavity formed from a plurality of walls of said acoustic wave sensor, wherein each sensing component of said plurality of sensing components is coated with a differing sensing film, and wherein each sensing component of said plurality of sensing components comprises a quartz crystal;
>
> a plurality of oscillators associated with said plurality of sensing components, wherein each sensing component of said plurality of sensing components is located in a feedback loop with an oscillator of said plurality of oscillators to thereby provide a multiple mode acoustic wave sensor that provides multiple mode frequency outputs thereof; and
>
> a frequency counter that communicates with said plurality of oscillators, wherein said frequency counter is under the command of a processor, wherein a calculated difference among said multiple mode frequency outputs is utilized to promote an increase in sensing accuracy by eliminating responses due to environmental changes other than said monitored chemical species.

For example, neither Pfeifer nor Frye '094 teach a frequency counter under the command or a processor, or a plurality of quartz crystal sensing components each of which is covered by a different sensing film. The device of Pfeifer, for example, operates under particular frequency ranges. Taking the sensing films from Frye '094 and combining these with Pfeifer would likely damage these operating frequency ranges, thereby rendering the resulting device useless. It is not likely that one skilled in the art would thus look to Pfeifer for "different sensing films" as a basis for modifying/damaging the Frye '094 device. Also, it is highly

unlikely that the quartz crystal microbalances of Pfeifer would operate if covered by the coatings of Frye '094. The Examiner has not explained how a reasonable expectation of success for a combination would be achieved, given that such quartz crystal microbalances would not function if covered by the coatings of Frye '094.

Additionally, neither Frye '094 nor Pfeifer teach that the differing sensing film comprises sensing film materials such that said differing sensing film comprises desired response properties by mixing analyte molecules and said sensing film materials mixed in a solution in order to result a suitable formation of said sensing film based on an interaction force selected by an affinity between said sensing film and said analyte, thereby achieving said sensing film with said desired response properties. Also, the Examiner has not identified the following in Frye '094 and Pfeifer: multiple modes frequency outputs comprising flexural plate mode (FMP) data, acoustic plate mode data, and shear-horizontal acoustic plate mode (SH-APM) data; amplitude plate mode (APM) data, thickness shear mode (TSM) data, surface acoustic wave mode (SAW), and bulk acoustic wave mode (BAW) data.

Based on the foregoing, the Applicant submits that the rejection to claims 1-4, 9, 15, 16, 18, 19, 21, and 23 under 35 U.S.C. 103 based on Pfeifer and Frye '094 has been traversed. The Applicant respectfully requests withdrawal of the rejection to claims 4, 9, 15, 16, 18, 19, 21, and 23 under 35 U.S.C. 103 base don Pfeifer and Frye '094.

Pfeifer '993 in view of Frye '094

The Examiner rejected claims 1-4, 9, 15, 16, 18, 19, 21, and 23 under 35 U.S.C. 103(a) as being unpatentable over Pfeifer et al (U.S. Patent No. 5,795,993), hereinafter Pfeifer '993 in view of Frye '094.

The Examiner argued that Pfeifer '993 discloses an acoustic wave sensor comprising an acoustic wave device such as a SAW device, a flexural plate wave (FPW) device, an acoustic plate mode (APM) device, or a thickness shear mode

(TSM) (arguing that this is also known as quartz crystal microbalance or QCM) device having a sensing region. The Examiner asserted that Pfeifer '993 discloses that the sensing region includes a sensing film for sorbing a quantity of the photoresist-stripping agent, thereby altering or shifting a frequency of oscillation of an acoustic wave. The Examiner also asserted that Pfeifer '993 discloses that in a preferred embodiment of the invention, the acoustic wave device is a SAW device and the sensing film comprises poly(vinylacetate), poly (N-vinylpyrrolidinone), or poly(vinylphenol). The Examiner cited the abstract of Pfeifer '993 in support of this argument.

The Examiner further asserted that Pfeifer '993 discloses than an acoustic wave sensor 10 comprises an acoustic wave device 12 having a sensing region 14 including the photoresist-stripping agent sensing film 16 on the surface for sorbing (the Examiner cited lines 35-67, col. 3, FIG. 1 of Pfeifer '993 in support of this argument).

The Examiner further argued that Pfeifer '993 discloses gas-phase applications utilizing a SAW, while other applications utilize FPW, APM or TSM (QCM) devices. The Examiner also argued that Pfeifer '993 discloses that while only a single acoustic wave device 12 is shown in FIG. 1, one or more additional acoustic wave devices may be used for the acoustic wave sensor to detect a plurality of different agents, or to provide a reference for accurately determining the frequency shift and to compensate for environmental factors including temperature and humidity (the Examiner referred to lines 1-18, Col. 4, and FIG. 1 of Pfeifer '993). The Examiner asserted that Pfeifer '993 discloses that the SAW device has a substrate made of piezoelectric material, such as lithium niobate, crystalline quartz, lithium tantalite, or the like (the Examiner cited lines 18-24, Col. 4 of Pfeifer '993 in support of this argument).

The Examiner also argued that Pfeifer '993 discloses that electrical means 20 are connected to a device for generating an acoustic wave and includes an amplifying means 26 for receiving a detected signal. The Examiner further argued

that Pfeifer '993 discloses that by locating the acoustic-wave sensor in a feedback loop of the amplifying means, a free-running oscillator is formed with the frequency of oscillation changing slightly with the amount of PSA sorbed on or desorbed from the sensing film. The Examiner asserted that Pfeifer '993 also discloses that the frequency detection means 28 is a frequency counter, and may include a reference means (the Examiner cited as an example, a second free-running oscillator comprising a second acoustic-wave device connected in a feedback loop of a second amplifier) (the Examiner also cited lines 20-52, Col. 6, and FIG. 1 of Pfeifer '993).

The Examiner further asserted that Pfeifer '993 discloses that in another embodiment the electrical means 20 comprises amplifying means 26 connected across each of the acoustic wave and SAW devices, with each SAW device forming a free-running oscillator (citing lines 43-67 col. 7 of Pfeifer).

The Examiner argued that Pfeifer '993 discloses multiple acoustic wave devices used for the acoustic wave sensor as well as multiple sensing films, but admitted that Pfeifer '993 does not disclose differing sensing films on the sensing regions of the devices.

The Examiner indicated that Frye '094 has been discussed above, and that it would have been obvious to modify Pfeifer '993 to include differing sensing films such as taught by Frye '094 so as to provide a more selective AW sensor.

The Applicant respectfully disagrees with this assessment. The combination of Pfeifer '993 and Frye '094 does not disclose <u>all</u> of the following claim limitations:

an acoustic wave sensor comprising a plurality of sensing components for monitoring a chemical species, wherein said plurality of sensing components is disposed within a cavity formed from a plurality of walls of said acoustic wave sensor, wherein each sensing component of said plurality of sensing components is coated with a differing sensing film, and wherein each sensing component of said plurality of sensing components comprises a quartz crystal;

a plurality of oscillators associated with said plurality of sensing components, wherein each sensing component of said plurality of sensing components is located in a feedback loop with an oscillator of said plurality of oscillators to thereby provide a multiple mode acoustic wave sensor that provides multiple mode frequency outputs thereof; and

a frequency counter that communicates with said plurality of oscillators, wherein said frequency counter is under the command of a processor, wherein a calculated

difference among said multiple mode frequency outputs is utilized to promote an increase in sensing accuracy by eliminating responses due to environmental changes other than said monitored chemical species.

For example, neither Pfeifer '993 nor Frye '094 teach a frequency counter under the command or a processor, or a plurality of quartz crystal sensing components each of which is covered by a different sensing film. The device of Pfeifer '993, for example, operates under particular frequency ranges. Taking the sensing films from Frye '094 and combining these with Pfeifer '993 would likely damage these operating frequency ranges, thereby rendering the resulting device useless. It is not likely that one skilled in the art would thus look to Pfeifer for "different sensing films" as a basis for modifying/damaging the Frye '094 device. Also, it is highly unlikely that the quartz crystal microbalances of Pfeifer '993 would operate if covered by the coatings of Frye '094. The Examiner has not explained how a reasonable expectation of success for a combination would be achieved, given that such quartz crystal microbalances would not function if covered by the coatings of Frye '094.

Additionally, neither Frye '094 nor Pfeifer '993 teach that the differing sensing film comprises sensing film materials such that said differing sensing film comprises desired response properties by mixing analyte molecules and said sensing film materials mixed in a solution in order to result a suitable formation of said sensing film based on an interaction force selected by an affinity between said sensing film and said analyte, thereby achieving said sensing film with said desired response properties.

Based on the foregoing, the Applicant submits that the rejection to claims 1-4, 9, 15, 16, 18, 19, 21, and 23 under 35 U.S.C. 103 based on Pfeifer '993 and Frye '094 has been traversed. The Applicant respectfully requests withdrawal of the rejection to claims 4, 9, 15, 16, 18, 19, 21, and 23 under 35 U.S.C. 103 base don Pfeifer '993 and Frye '094.

Martin in view of Frye '094 in view of Neuburger

Claims 2, 16, 19, 21, and 23 were rejected under 35 U.S.C. 103(a) as being unpatentable over Martin in view of Frye '094 as applied to claims 1, 3, 4, 9, and 15 and in further view of Neuburger (U.S. Patent No. 5,065,140).

The Examiner admitted that Martin/Frye does not disclose a single frequency counter that communicates with the plurality of oscillators. The Examiner also admitted that Martin does not disclose that each of the sensing components comprises a quartz crystal.

The Examiner argued that Neuburger discloses a gas detection system in which multiple microbalance detectors 122 comprising quartz crystal oscillators are used and the rate of change of crystal oscillation frequency is monitored by a frequency counter 130 under the control of a processor 112 (the Examiner cited the abstract, columns 2-3, and FIG. 1 of Neuburger).

The Examiner asserted that it would have been obvious to modify the Martin/Frye '094 device to use quartz crystal, asserting that sensing devices such as taught by Neuburger as quartz crystal is a known alternative sensing component for use in producing oscillation frequencies that may be measured and monitored by a frequency counter for gas-phase detection applications. The Applicant respectfully disagrees with this assessment. As indicated earlier, it would not be proper to combine the Martin and Frye '094 device as argued by the Examiner. That is, there is not a reasonable expectation of success for such a combination given, for example, the fact that Martin operates at a particular IDT frequency the use of the coatings from Frye '094 would upset the delicate frequency range of Martin rendering the resulting device unusable. Similarly, the quartz crystal from Neuburger operates at particular oscillation frequencies. Adapting the quartz crystal from Neuburger to the Martin / Frye '094 would also result in a device of different frequencies, thereby resulting in a device that would not function properly. The Examiner has not made explicit exactly how and why the quartz crystal from Neuburger would function properly with the Martin / Frye '094 combination. Merely

alleging that the quartz crystal of Neuburger could be used with the Martin / Frye '094 combination is not sufficient for purposes of satisfying the primary facie obviousness test discussed earlier and the requirements of the KSR case. The Examiner must provide details as to which components of Neuburger would actually be connected which particular components of Martin / Frye '094 to achieve a functioning device. This is particularly troubling given the fact that Neuburger does not provide for a teaching of quartz crystals covered by different sensing films. Covering the microbalance detectors 122 of Neuburger with different sensing films would actually limit the effectiveness of the Neuburger device as much as it would the combination of Martin / Frye '094.

As such, the Applicant submits that the rejection to claims 2, 16, 19, 21, and 23 under 35 U.S.C. 103(a) as being unpatentable over Martin in view of Frye '094 as applied to claims 1, 3, 4, 9, and 15 and in further view of Neuburger fails. Applicant therefore respectfully requests withdrawal of this rejection.

Martin in view of Frye '094 in view of Tsutsumi

Claims 5-7 were rejected under 35 U.S.C. 103(a) as being unpatentable over Martin in view of Frye '094 as applied to claims 1, 3, 4, 9, and 15 and in further view of Tsutsumi et al. (U.S. Patent No. 6,075,426), hereinafter Tsutsumi.

The Examiner admitted that Martin / Frye '094 does not specifically disclose frequency outputs of at least one of torsional mode data, love wave data, LSAW and PSAW.

The Examiner also admitted that Martin / Frye '094 does not disclose frequency outputs of at least one of transverse mode data, surface-skimming mode data, surface transverse mode data, harmonic mode data, and overtone mode data.

The Examiner argued that Tsutsumi discloses a surface acoustic wave device in which the mode of the SAW is not limited to Rayleigh wave, but may be of any

mode such as leaky surface acoustic wave, surface skimming wave or surface transverse wave (the Examiner referred to lines 13-16, col. 11 of Tsutsumi in support of this argument).

The Examiner argued that it would have been obvious to modify Martin/Frye '094 to include modes such as leaky surface acoustic wave, surface skimming wave, or surface transverse wave such as taught by Tsutsumi in order to provide additional modes to the device to increase the utility.

The Applicant respectfully disagrees with this assessment. The Examiner has not indicated how one skilled in the art would actually have modified Martin/Frye '094 to include modes such as leaky surface acoustic wave, surface skimming wave, or surface transverse wave such as taught by Tsutsumi in order to provide additional modes to the device to increase the utility. Given that Martin and Frye '094 each operate at different frequencies based on pre-set and pre-fabricated IDTs, etc., which components of Martin and Frye '094 would actually be modified successfully and with a reasonable expectation of success to include modes such as leaky surface acoustic wave, surface skimming wave, or surface transverse wave such as taught by Tsutsumi in order to provide additional modes to the device to increase the utility. In fact, because the Tsutsumi device also operates with acoustic wave components operating at different frequencies, the utility of the resulting device combination would actually decrease or may be null given these different frequencies. Which specific components of Martin and Frye '094 would be modified and how would such components be modified to work with the Tsutsumi device. Because different frequencies are present in all of these devices it is highly unlikely that one skilled in the art would achieve a workable device and one which includes all of the claim limitations of Applicant's claims 5-7.

The Examiner has further has not made explicit what would have prompted a person of ordinary skill in the art to combine the elements as the Applicant's invention does, based on Martin / Frye '094 and Tsutsumi. The Examiner's analysis was not made explicit in that the Examiner did not explain, which specific

components of Tsutsumi when combined with which specific components of Martin / Frye '094 would provide for the specific modes of leak surface acoustic wave, surface skimming wave, or surface transverse waves with respect to Applicant's claimed components. Additionally, the Examiner has not made explicit how and why a reasonable expectation of success would accrue from the combination of Martin / Frye '094 and Tsutsumi to provide for each of the claim limitations of Applicant's claims 5-7. The Examiner has also not made explicit how the combination of Martin / Frye '094 and Tsutsumi would provide for each of the claim limitations of Applicant's claims 5-7. Thus there is an absence of *prima facie* showing of obviousness by the Examiner of a *prima facie* showing by the Examiner of a *reason* to combine the Martin / Frye '094 and Tsutsumi references. Thus, the Examiner had not produced in support of the obviousness rejection to claims 5-7, evidence compelling a conclusion that the basic criterion of a prima facie case of obviousness has been met. The Applicant therefore submits that the rejection to claims 5-7 has been traversed. Applicant respectfully requests withdrawal of the aforementioned rejection to claims 5-7 under 35 U.S.C. 103 based on the combination of the Pfeifer '944 / Frye '094 and Tsutsumi references.

Pfeifer '944 in view of Frye '094 in view of Tsutsumi

Claims 5-7 were rejected under 35 U.S.C. 103(a) as being unpatentable over Pfeifer '944 in view of Frye '094 as applied to claims 1-4, 9, 15, 16, 18, 19, 21, and 23 and in further view of Tsutsumi.

The Examiner admitted that Pfeifer '944 / Frye '094 does not specifically disclose frequency outputs of at least one of torsional mode data, love wave data, LSAW and PSAW.

The Examiner also admitted Pfeifer '944 / Frye '094 does not disclose frequency outputs of at least one of transverse mode data, surface-skimming mode data, surface transverse mode data, harmonic data, and overtone mode data.

The Examiner stated that Tsutsumi has been discussed above and then argued that it would have been obvious to modify Pfeifer '944 / Frye '094 to include such modes as leaky surface acoustic wave, surface skimming wave, or surface transverse wave such as taught by Tsutsumi in order to provide additional modes to the device to increase its utility.

The Applicant respectfully disagrees with this assessment. The Examiner did explicitly describe how one skilled in the art would have modified Pfeifer '944 / Frye '094 to include the specific modes of leak surface acoustic wave, surface skimming wave, or surface transverse waves of Tsutsumi to provide additional modes to increase its utility. What specific components of Pfeifer '944 / Frye '094 would be modified to function with Tsutsumi to provide additional modes to increase its utility?

The Examiner has further has not made explicit what would have prompted a person of ordinary skill in the art to combine the elements as the Applicant's invention does, based on Pfeifer '944 / Frye '094 and Tsutsumi. The Examiner's analysis was not made explicit in that the Examiner did not explain, which specific components of Tsutsumi when combined with which specific components of Pfeifer '944 / Frye '094 would provide for the specific modes of leak surface acoustic wave, surface skimming wave, or surface transverse waves with respect to Applicant's claimed components. Additionally, the Examiner has not made explicit how and why a reasonable expectation of success would accrue from the combination of Pfeifer '944 / Frye '094 and Tsutsumi to provide for each of the claim limitations of Applicant's claims 5-7. The Examiner has also not made explicit how the combination of Pfeifer '944 / Frye '094 and Tsutsumi would provide for each of the claim limitations of Applicant's claims 5-7. Thus there is an absence of *prima facie* showing of obviousness by the Examiner of a *prima facie* showing by the Examiner of a *reason* to combine the Pfeifer '944 / Frye '094 and Tsutsumi references. Thus, the Examiner had not produced in support of the obviousness rejection to claims 5-7, evidence compelling a conclusion that the basic criterion of a prima facie case of

obviousness has been met. The Applicant therefore submits that the rejection to claims 5-7 has been traversed. Applicant respectfully requests withdrawal of the aforementioned rejection to claims 5-7 under 35 U.S.C. 103 based on the combination of the Pfeifer '944 / Frye '094 and Tsutsumi references.

Martin in view of Frye in view of Desu

Claim 13 was rejected under 35 U.S.C. 103(a) as being unpatentable over Martin in view of Frye as applied to claims 1, 3, 4, 9, and 15 and in further view of Desu et al (U.S. Patent No. 5,527,567), hereinafter Desu.

The Examiner admitted that Martin/Frye '094 does not specifically disclose that the sensing components comprise electrode materials chosen from among the group comprising at least one of TiN, CoSi2, and WC.

The Examiner argued, however, that Desu discloses high quality layered structure oxide ferroelectric thin films which are useful in the applications of piezoelectric transducers and surface acoustic wave devices (the Examiner cited lines 33-43, Col. 4 of Desu in support of this argument). The Examiner further argued that Desu discloses a think bottom layer electrode that is deposited on top of the substrate, and may be a conductive nitride such as TiN (the Examiner cited lines 10-27, Col. 6, in support of this argument).

The Applicant respectfully disagrees with this assessment. Applicant's amended claim 13 indicates wherein said sensing components of said plurality of sensing components comprise electrode materials chosen from among a group consisting of the following metal-nonmetal compounds: TiN, CoSi2, and WC. The combination of Martin, Frye '094 and Desu does not provide for a teaching or suggestion of such a group including all of TiN, CoSi2, and WC. As such, the Applicant submits that the rejection to claim 13 under 35 U.S.C. 103(a) based on the combination of Martin, Frye '094 and Desu has been traversed. Applicant respectfully requests withdrawal of the aforementioned rejection to claim 13.

Pfeifer '944 in view of Frye '094 in view of Desu

Claim 13 was rejected under 35 U.S.C. 103(a) as being unpatentable over Pfeifer '944 in view of Frye '094 as applied to claims 1-4, 9, 15, 16, 18, 19, 21, and 23 and in further view of Desu.

The Examiner admitted that Pfeifer '944 / Frye '094 do not specifically disclose that the sensing components comprise electrode materials chosen from among the group comprising at least one of TiN, CoSi2 and WC.

The Examiner then indicated that Desu has been discussed above and asserted that it would have been obvious to modify Pfeifer '944 / Frye '094 to include TiN as the electrode material such as taught by Desu in order to provide a known electrode material, in the form of a conductive nitride, on the surface of a substrate for use in a surface acoustic wave device.

The Applicant respectfully disagrees with this assessment. Applicant's amended claim 13 indicates wherein said sensing components of said plurality of sensing components comprise electrode materials chosen from among a group consisting of the following metal-nonmetal compounds: TiN, CoSi2, and WC. The combination of Pfeifer '944, Frye '094 and Desu does not provide for a teaching or suggestion of such a group including all of TiN, CoSi2, and WC. As such, the Applicant submits that the rejection to claim 13 under 35 U.S.C. 103(a) based on the combination of Pfeifer '944, Frye '094 and Desu has been traversed. Applicant respectfully requests withdrawal of the aforementioned rejection to claim 13.

Pfeifer '993 in view of Frye '094 in view of Desu

Claim 13 was rejected under 35 U.S.C. 103(a) as being unpatentable over Pfeifer '993 in view of Frye '094 as applied to claims 1-4, 9, 15, 16, 18, 19, 21, and 23 and in further view of Desu

The Examiner admitted that Pfeifer '993 / Frye '094 do not specifically disclose that the sensing components comprise electrode materials chosen from among the group comprising at least one of TiN, CoSi2 and WC.

The Examiner then stated that Desu has been discussed above and asserted that it would have been obvious to modify Pfeifer '993 / Frye '094 to include TiN as the electrode material such as taught by Desu in order to provide a known electrode material, in the form of a conductive nitride, on the surface of a substrate for use in a surface acoustic wave device.

The Applicant respectfully disagrees with this assessment. Applicant's amended claim 13 indicates wherein said sensing components of said plurality of sensing components comprise electrode materials chosen from among a group consisting of the following metal-nonmetal compounds: TiN, CoSi2, and WC. The combination of Pfeifer '993, Frye '094 and Desu does not provide for a teaching or suggestion of such a group including all of TiN, CoSi2, and WC. As such, the Applicant submits that the rejection to claim 13 under 35 U.S.C. 103(a) based on the combination of Pfeifer '993, Frye '094 and Desu has been traversed. Applicant respectfully requests withdrawal of the aforementioned rejection to claim 13.

Martin in view of Frye '094 in view of Ueda et al

Claim 14 was rejected under 35 U.S.C. 103(a) as being unpatentable over Martin in view of Frye '094 as applied to claims 1, 3, 4, 9, and 15, and in further view of Ueda et al (U.S. Patent No. 6,037,847), hereinafter Ueda.

The Examiner admitted that Martin/Frye '094 does not specifically disclose that the sensing components comprise electrode materials chosen from among NiCr and CuAl.

The Examiner argued, however, that Ueda discloses a surface acoustic wave device in which an interdigital electrode of an AlCu alloy is used with an Y-X cut of a $LiTaO_3$ (the Examiner cited Ueda, Abstract, lines 7-17, col. 2 in support of this argument).

The Examiner argued that it would have been obvious to modify Martin/Frye '094 to include an AlCu alloy material for the interdigital electrode such as taught by

Ueda in order to provide Martin/Frye '094 with a known electrode material for a SAW device (arguing, for both surface and leaky surface acoustic waves).

Applicant respectfully disagrees with this assessment. Applicant's amended claim 14 indicates wherein said sensing components of said plurality of sensing components comprise electrode materials chosen from among a group consisting of the following alloys: NiCr and CuAl. The combination of Martin/Frye '094 and Ueda does not provide for a teaching or suggestion of such a group including all of NiCr and CuAl. As such, the Applicant submits that the rejection to claim 14 under 35 U.S.C. 103(a) based on the combination of Martin/Frye '094 and Ueda has been traversed. Applicant respectfully requests withdrawal of the aforementioned rejection to claim 14.

Pfeifer '944 in view of Frye '094 in view of Ueda

Claim 14 was rejected under 35 U.S.C. 103(a) as being unpatentable over Pfeifer '944 in view of Frye '094 as applied to claims 1-4, 9, 15, 16, 18, 19, 21, and 23 and in further view of Ueda.

The Examiner admitted that Pfeifer '944 / Frye '094 do not specifically disclose that the sensing components comprise electrode materials chosen from among NiCr and CuAl.

The Examiner then stated that Ueda has been discussed above and that it would have been obvious to modify Pfeifer '944 / Frye '094 to include an AlCu alloy material for the interdigital electrode such as taught by Ueda in order to provide Pfeifer '944 / Frye '094 with a known electrode material for a SAW device (for both surface and leak surface acoustic waves).

Applicant respectfully disagrees with this assessment. Applicant's amended claim 14 indicates wherein said sensing components of said plurality of sensing components comprise electrode materials chosen from among a group consisting of the following alloys: NiCr and CuAl. The combination of Pfeifer '944 / Frye '094 and Ueda does not provide for a teaching or suggestion of such a group including all of

NiCr and CuAl. As such, the Applicant submits that the rejection to claim 14 under 35 U.S.C. 103(a) based on the combination of Pfeifer '944 / Frye '094 and Ueda has been traversed. Applicant respectfully requests withdrawal of the aforementioned rejection to claim 14.

Pfeifer '993 in view of Frye '094 in view of Ueda

The Examiner rejected claim 14 under 35 U.S.C. 103(a) as being unpatentable over Pfeifer '993 in view of Frye '094 as applied to claims 1-4, 9, 15, 16, 18, 19, 21, and 23 and further in view of Ueda.

The Examiner admitted that Pfeifer '993 / Frye '094 do not specifically disclose that the sensing components comprise electrode material from among NiCr and CuAl.

The Examiner further stated that Ueda has been discussed above and that it would have been obvious to modify Pfeifer '993 / Frye '094 to include an AlCu alloy material for the interdigital electrode such as taught by Ueda in order to provide Pfeifer '993 / Frye '094 with a known electrode material for a SAW device (arguing for both surface and leak surface acoustic waves.

Applicant respectfully disagrees with this assessment. Applicant's amended claim 14 indicates wherein said sensing components of said plurality of sensing components comprise electrode materials chosen from among a group consisting of the following alloys: NiCr and CuAl. The combination of Pfeifer '993 / Frye '094 and Ueda does not provide for a teaching or suggestion of such a group including all of NiCr and CuAl. As such, the Applicant submits that the rejection to claim 14 under 35 U.S.C. 103(a) based on the combination of Pfeifer '993 / Frye '094 and Ueda has been traversed. Applicant respectfully requests withdrawal of the aforementioned rejection to claim 14.

Martin in view of Frye '094 in view of Pfeifer '993

The Examiner rejected claim 18 under 35 U.S.C. 103(a) as being unpatentable over Martin in view of Frye '094 as applied to claims 1, 3, 4, 9, and 15, and in further view of Pfeifer '993

The Examiner admitted that Martin/Frye '094 does not specifically disclose a piezoelectric material among a group comprising at least one of a: quartz, lithium niobate, lithium tantalite, Li2B4O7, GaPO4, langasite, ZnO, and epitaxially grown nitrides including Al, Ga, or In.

The Examiner then indicated that Pfeifer '993 has been discussed above and argued that it would have been obvious to modify Martin/Frye '094 to include lithium niobate, crystalline quartz, or lithium tantalate as a piezoelectric material such as taught by Pfeifer '993 in order to provide a known piezoelectric material for use in surface acoustic wave sensors.

The Applicant respectfully disagrees with this assessment. Applicant's amended claim 18 includes the claim limitation of wherein said sensing components comprise piezoelectric materials chosen from among a group consisting of the following materials: α-quartz, lithium niobate (LiNbO3), lithium tantalate (LiTaO3), Li2B4O7, AlPO4, GaPO4, langasite (La3Ga5SiO14), ZnO, and epitaxially grown nitrides including Al, Ga or In. The combination of Martin in view of Frye '094 as applied to claims 1, 3, 4, 9, and 15, and in further view of Pfeifer '993 does not therefore teach or suggest all of the claim limitations of Applicant's claim 18. Applicant therefore respectfully requests withdrawal of the aforementioned rejection to claim 18.

Martin in view of Frye '094 in view of Neuburger in view of Ueda

The Examiner rejected claim 22 under 35 U.S.C. 103(a) as being unpatentable over Martin in view of Frye '094 as applied to claims 1, 3, 4, 9, and 15 and in view of Neuburger as applied to claims 2, 16, 19, 21, and 23, and in further view of Ueda.

The Examiner admitted that Martin/Frye'094/Neuburger do not disclose the sensing comprising comprising electrode materials chosen from among NiCr and CuAl.

The Examiner then stated that Ueda has been discussed above and argued that it would have been obvious to modify Martin/Frye '094/Neuburger to include an AlCu alloy material for the interdigital electrode such as taught by Ueda in order to provide Martin/Frye '094/Neuberger with a known electrode material for a SAW device (asserting, for both surface and leaky surface acoustic waves).

Pfiefer '944 in view of Frye '094 in view of Ueda

The Examiner rejected claim 22 as being unpatentable over Pfiefer '944 in view of Frye '094 as applied to claims 1-4, 9, 15, 16, 18, 19, 21 and 23 and in further view of Ueda.

The Examiner admitted that Pfiefer '944/Frye '094 do not disclose the sensing components comprising electrode materials chosen from NiCr and CuAl.

The Examiner then stated that Ueda has been discussed above and that it would have been obvious to modify Pfiefer '944 / Frye '094 to include an AlCu alloy material for the interdigital electrode such as taught by Ueda in order to provide Pfiefer '944 / Frye '094 with a known electrode material for a SAW device (for both surface and leaky surface acoustic waves).

Pfiefer '993 in view of Frye '094 in view of Ueda

Claim 22 was rejected under 35 U.S.C. 103(a) as being unpatentable over Pfiefer '993 in view of Frye '094 as applied to claims 1-4, 9, 15, 16, 18, 19, 21, and 23 and in further view of Ueda.

The Examiner admitted that Pfiefer '993 / Frye '094 does not disclose the sensing components comprising electrode materials chosen from among NiCr and CuAl

The Examiner stated that Ueda has been discussed above and asserted that it would have been obvious to modify Pfiefer '993 / Frye '094 to include an AlCu alloy material for the interdigital electrode such as taught by Ueda in order to provide Pfiefer '993 / Frye '094 with a known electrode material for a SAW device (the Examiner argued "for both surface and leaky surface acoustic waves").

The Applicant respectfully disagrees with this assessment. Amended claim 22 is directed toward the following claim limitations: The system of claim 19 wherein said sensing components of said plurality of sensing components comprise electrode materials chosen from among a group consisting of the following alloys: NiCr and CuAl. Neither Ueda nor Pfiefer '993 / Frye '094, alone or in combination with one another, teach, suggest or disclose all of the claim limitations of Applicant's amended claim 22. As such, the Applicant submits that the rejection to claim 22 has been traversed. The Applicant therefore respectfully requests withdrawal of the aforementioned rejection to claim 22.

Martin in view of Frye '094 in view of Neuburger in view of Miyazaki

Claim 24 was rejected under 35 U.S.C. 103(a) as being unpatentable over Martin in view of Frye '094 as applied to claims 1, 3, 4, 9, and 15 and in view of Neuburger as applied to claims 2, 16, 19, 21, and 23, and in further view of Miyazaki et al (U.S. Patent No. 5,412,597), hereinafter Miyazaki.

The Examiner admitted that Martin / Frye '094/ Neuburger do not specifically disclose sensing components of electrode materials that include at least one of COSi2 and WC.

The Examiner argued, however, that Miyazaki discloses vibrating a probe by an ultrasonic wave and measuring an acoustic wave generated in a sample, in which a probe electrode can be formed of any material exhibit conductivity, such as WC. In support of this argument, the Examiner cited Miyazaki, lines 1-22, Col. 9; and lines 1-9, Col. 14.

The Examiner asserted that it would have been obvious to modify Martin/Frye '094/Neuburger to include electrode materials such as WC such as taught by Miyazaki in order to provide an alternative, known conductive electrode material.

The Applicant respectfully disagrees with this assessment. Claim 24 has been cancelled via the amendments indicated herein. Applicant therefore submits that the aforementioned rejection to claim 24 is rendered moot in light of the cancellation of claim 24.

Pfeifer '944 in view of Frye '094 in view of Miyazaki

Claim 24 was rejected under 35 U.S.C. 103(a) as being unpatentable over Pfeifer '944 in view of Frye '094 as applied to claims 1-4, 9, 15, 16, 18, 19, 21, and 23 and in further view of Miyazaki

The Examiner stated that Miyazaki has been discussed above and then argued that it would have been obvious to modify Pfiefer '944 / Frye'094 to include electrode material such as WC such as taught by Miyazaki in order to provide an alternative, known conductive electrode material.

The Applicant respectfully disagrees with this assessment. Claim 24 has been cancelled via the amendments indicated herein. Applicant therefore submits that the aforementioned rejection to claim 24 is rendered moot in light of the cancellation of claim 24.

Pfeifer '993 in view of Frye '094 in view of Miyazaki

Claim 24 was rejected under 35 U.S.C. 103(a) as being unpatentable over Pfiefer '993 in view of Frye '094 as applied to claims 1-4, 9, 15, 16, 18, 19, 21, and 23 and in further view of Miyazaki

The Examiner asserted that Miyazaki has been discussed above.

The Examiner further argued that it would have been obvious to modify Pfiefer '993 / Frye '094 to include electrode materials such as WC such as taught by Miyazaki in order to provide an alternative, known conductive electrode material.

The Applicant respectfully disagrees with this assessment. Claim 24 has been cancelled via the amendments indicated herein. Applicant therefore submits that the aforementioned rejection to claim 24 is rendered moot in light of the cancellation of claim 24.

Martin in view of Frye '094 in view of Pfiester

Claim 25 was rejected under 35 U.S.C. 103(a) as being unpatentable over Martin in view of Frye '094 as applied to claims 1, 3, 4, 9, and 15 and in further view of Pfiester (U.S. Patent No. 5,264,380).

The Examiner admitted that Martin/Frye '094 does not specifically disclose sensing components comprising electrode materials composed of cobalt silicide (CoSi2).

The Examiner argued that Pfiester discloses a MOS transistor in which the gate 24 is formed from a refractory metal silicide such as cobalt silicide. The Examiner cited lines 16-30, col. 3 in support of this argument.

The Examiner asserted that it would have been obvious to modify Martin/Frye '094 to include the electrode material of cobalt silicide such as taught by Pfiester in order to provide an alternative, known electrode material.

The Applicant respectfully disagrees with this assessment. Claim 25 has been cancelled via the amendments indicated herein. Applicant therefore submits that the aforementioned rejection to claim 25 is rendered moot in light of the cancellation of claim 25.

Pfeifer '944 in view of Frye '094 in view of Pfiester

Claim 25 was rejected under 35 U.S.C. 103(a) as being unpatentable over Pfeifer '944 in view of Frye '094 as applied to claims 1-4, 9, 15, 16, 18, 19, 21 and 23 and in further view of Pfiester (U.S. Patent No. 5,264,380).

The Examiner admitted that Pfeifer '993 / Frye '094 do not specifically disclose sensing components comprising electrode materials composed of cobalt silicide (CoSi2).

The Examiner argued that Pfiester discloses an MOS transistor in which the gate electrode 24 is formed from a refractory metal silicide such as cobalt silicide. The Examiner cited lines 16-30, col. 3 of Pfiester in support of this argument.

The Examiner argued that it would have been obvious to modify Pfeifer '993 / Frye '094 to include the electrode material of cobalt silicide such as taught by Pfiester in order to provide an alternative, known electrode material.

The Applicant respectfully disagrees with this assessment. Claim 25 has been cancelled via the amendments indicated herein. Applicant therefore submits that the aforementioned rejection to claim 25 is rendered moot in light of the cancellation of claim 25.

Martin in view of Frye '094 in view of Miyazaki

Claim 26 was rejected under 35 U.S.C. 103(a) as being unpatentable over Martin in view of Frye '094 as applied to claims 1, 3, 4, 9, and 15 and in further view of Miyazaki.

The Examiner stated that Miyazaki has been discussed above and admitted that Martin/Frye '094 does not specifically disclose sensing components comprising electrode materials composed of WC.

The Examiner argued that it would have been obvious to modify Martin/Frye '094 to include electrode materials such as WC such as taught by Miyazaki in order to provide a known conductive electrode material.

The Applicant respectfully disagrees with this assessment. Claim 26 has been cancelled via the amendments indicated herein. Applicant therefore submits

that the aforementioned rejection to claim 26 is rendered moot in light of the cancellation of claim 26.

Pfiefer '944 in view of Frye '094 in view of Miyazaki

Claim 26 was rejected under 35 U.S.C. 103(a) as being unpatentable over Pfiefer '944 in view of Frye '094 as applied to claims 1-4, 9, 15, 16, 18, 19, 21, and 23 and in further view of Miyazaki.

The Examiner stated that Miyazaki has been discussed above and then admitted that Pfiefer '944 / Frye '094 does not specifically disclose sensing components comprising electrode materials composed of WC.

The Examiner argued that it would have been obvious to modify Pfeifer '944 / Frye '094 to include electrode materials such as WC such as taught by Miyazaki in order to provide a known conductive electrode material.

The Applicant respectfully disagrees with this assessment. Claim 26 has been cancelled via the amendments indicated herein. Applicant therefore submits that the aforementioned rejection to claim 26 is rendered moot in light of the cancellation of claim 26.

Pfiefer '993 in view of Frye '094 in view of Miyazaki

Claim 26 was rejected under 35 U.S.C. 103(a) as being unpatentable over Pfiefer '993 in view of Frye '094 as applied to claims 1-4, 9, 15, 16, 18, 19, 21, and 23 and in further view of Miyazaki.

The Examiner stated that Miyazaki has been discussed above and then admitted that Pfiefer '993 / Frye '094 does not specifically disclose sensing components comprising electrode materials composed of WC.

The Examiner therefore argued that it would have been obvious to modify Pfeifer '993 / Frye '094 to include electrode materials such as WC such as taught by Miyazaki in order to provide a known conductive electrode material.

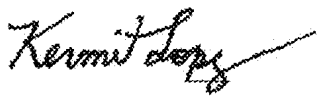
The Applicant respectfully disagrees with this assessment. Claim 26 has been cancelled via the amendments indicated herein. Applicant therefore submits that the aforementioned rejection to claim 26 is rendered moot in light of the cancellation of claim 26.

III. Conclusion

In view of the foregoing discussion, the Applicant has clarified the structural distinctions of the present invention. Reconsideration and allowance of Applicant's application is thus respectfully solicited.

Should there be any outstanding matters that need to be resolved, the Examiner is respectfully requested to contact the undersigned representative to conduct an interview in an effort to expedite prosecution in connection with the present application.

Respectfully submitted,



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